REMARKS

Support For Am ndment

The amendments to Claims 1, 12 and 21 are supported by Claims 2 and 24. No new matter has been added. Upon entry of this Amendment Claims 1, 3-12, 14, 15, 21-23, 25 and 27 are present and active in the application.

Request for Reconsideration

Applicant would like to thank Examiner Deo for the courteous and helpful discussion held with Applicant's representative on November 6, 2002. During this discussion it was noted that the present invention provides an unexpectedly superior etch selectivity: the present invention etches the metal silicide at rates at least 30 times faster than the rate at which the poly-Si is etched.

WSi_x/poly-Si stack structures are used for gate electrodes. It is therefore desirable to have a dry etch that will give a vertical profile and no trenching through the gate dielectric that lies beneath the stack. Fluorine-based etching gases have high etch rates, but have low selectivity to the gate oxide.

Chlorine-based etching gases provide higher selectivity, but are slower than fluorine-based etching. A study of this system indicated that concentrations of O_2 of less than 15% by volume have an improved etch rate, while at concentrations of O_2 of 25% by volume or more etching stops and a film is deposited (see Nojiri, et al., J. Vac. Sci. Technol. B14(3), May/June 1996, p. 1791-1795, cited in the Information Disclosure Statement filed herewith). The present invention makes use of the discovery that, contrary to these teachings, concentrations of O_2 of at least 25% by volume, not only provide high etch rates, but high selectivity over poly-Si, as well as oxide. Selectivity of 30 or more over poly-Si are observed.

The rejection of Claim 12 under 35 U.S.C. § 102 over Bourassa, et al. has been obviated by appropriate amendment. Claim 2 has been incorporated into Claim 12.

The rejection of Claims 1, 4, 6-8, 12, 15, 21, 24 and 26 under 35 U.S.C. § 102 over Tabara, et al., has been obviated by appropriate amendment. Claim 2 has been incorporated into Claims 1, 12 and 21.

The rejection of the claims under 35 U.S.C. § 103 over Tsai, Tabara, et al., individually or in combination with Langley, et al. is respectfully traversed. The claimed invention provides unexpectedly superior etch selectivity ratios, now specified in the claims; the etch rate of metal silicide is at least thirty times greater than the etch rate of poly-Si.

Tsai describes a method of etching metal silicides. Tsai is interested in high selectivity etching of metal silicide with respect to poly-Si (column 1, lines 59-62). The preferred volume ratio is O_2:N_2 of 0.25-5:1, and Cl_2:(O_2+N_2) of 5-20:1 (column 3, lines 26-30); this is a maximum O_2 concentration of about 15%. The greatest selectivity over poly-Si, about 5, is shown in Figure 7. There is no suggestion that greater selectivity may be obtained.

Tabara, et al. describes a conductive layer forming method using etching masks. This reference is concerned with etching WSi_2 or poly-Si, using TiN or TiON as a mask; the etching conditions should selectively etch the metal silicide or poly-Si with respect to the mask (column 2, lines 49-54). Very similar etching conditions, at 1mTorr, are used to etch both WSi_2 and poly-Si: Cl_2/O_2 gas ratios of 25/11 sccm are used for etching WSi_2, and 25/9 sccm are used for etching poly-Si (column 7, lines 9-26).

Figure 20 of Tabara, et al. compares the etch selectivity of WSi_2 and poly-Si to TiN under conditions of 1mTorr with a gas flow rate of Cl_2 of 25 sccm, while varying the O_2 flow rate: for any O_2 flow rate the etch selectivity of Si/TiN is always greater than the selectivity of WSi_2/TiN -- poly-Si is always etched faster than WSi_2 (compare curve on upper left with curve on bottom; all other curves only describe WSi_2/TiON etch selection ratios).

Langley has been cited for describing a breakthrough etch using CF_4. There is no suggestion for achieving high selectivity for poly-Si in a metal silicide etch.

As now claimed, the present invention specifies that the ratio of etch rates of metal silicide to poly-Si is at least 30. The applied references show an etch selectivity of at most 5, in systems where the authors were interested in high selectivity ratios. Accordingly, Applicant submits that the claimed invention provides unexpected and superior results. Accordingly, these results demonstrate that the claimed invention is

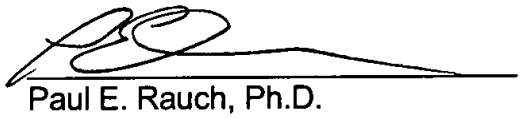
not obvious over the applied references. Withdrawal of this ground of rejection is respectfully requested.

Applicant will provide a Declaration re-presenting these unexpected and superior results, when it becomes available.

The rejection of the claims under 35 U.S.C. § 101 for double patenting is respectfully traversed. The other applications noted in the rejection are now abandoned. Withdrawal of this ground of rejection is respectfully requested.

Applicant submits the application is now ready for allowance. Early notice of such action is earnestly solicited.

Respectfully submitted,



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